CIS AND INFORMATION TECHNOLOGY CERTIFICATIONS: EDUCATION PROGRAM TRENDS AND IMPLICATIONS

By

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ABSTRACT

The fields of Computer Information Systems (CIS) and Information Technology (IT) are experiencing rapid change. In 2003, an analysis of IT degree programs and those of competing disciplines at 10 post-secondary institutions concluded that an information technology program is perceived differently from information systems and computer science. In these new subjects, voluntary professional certifications, generally known in the Information Technology field as "IT" certifications, are increasingly used as indicators of professional skill. Recent trends, including two studies described here, one measuring student outcomes and one measuring a subject group's responses to items that are nearly identical except for IT certification information, investigated the effectiveness and the student perceptions of IT industry certified instructors.

The results indicated that faculty with IT certification affected both student outcomes and student perceptions of instructor effectiveness, teaching methodology, student engagement in the class, and instructor technical qualifications. The results suggested that students' learning outcomes improved and student perceptions of CIS instructors with IT certifications positively enhanced their assessment of the instructor effectiveness, teaching methodology, and student engagement, and the perception of the instructor's technical competence. This has implications for CIS and especially IT academic programs, their faculty, recruiting, and professional development.

Keywords: Education, Technology, Instructor, Faculty, Information Technology, Professional, Certifications, Student Learning Outcomes, Student Perceptions, Professional Development.

INTRODUCTION

Since the 1990s, Information Technology (IT) certifications have increased in number and influence throughout the information technology career field and subfields. In order to establish the validity of technical certifications, McKillip (2001) reaffirmed the findings from earlier studies and raised the question: Are relevant Information Technology industry certifications an asset to the teaching profession as they appear to be in the business world (Jenkins, 2005; Potenza, 2005; Vakhitova, 2006)?

Significance of the Problem

In the 1990s, post-secondary Computer Information Systems (CIS)-related faculty members were largely unaware of the emergence of the parallel universe of post-secondary credentials (Adelman, 2000). The field of commercial and government information technology has long considered certification a necessary qualification for employment; employers have often required their employees to have pertinent IT certifications when hired or to obtain them within a specified period after hire (U.S. Department of Defense, 2004). Generally, CIS-related programs in traditional four-year and post-graduate colleges and universities have not followed this lead, generally refusing to offer credit courses that would prepare their traditional students for IT related certification tests, even though Awang, Anderson, and Baker (2003) emphasized that graduates holding IT certifications may provide a hiring preference for entry-level jobs, and IT certifications provide the undergraduates with the foundational experience to enable them to become highly proficient IT workers. At the undergraduate level, research suggests that educational outcomes that

include student preparation for IT industry certifications greatly benefit CIS graduates entering the workforce (Jenkins, 2005; Potenza, 2005; Vakhitova, 2006).

Certifications in IT in the Business World and Academia

In 1991, networking and other related CIS topics were not seen as a major curriculum content area, accounting for only six hours in the common requirements of the ACM/IEEE recommended model curriculum. Now, a multitude of diverse IT degrees can be pursued in fields other than the traditional Computer Science degree. After an analysis of CIS/IT degree programs at 10 universities, Ekstrom and Lunt (2003) concluded that an IT program is considerably different from computer science because it has significantly less math and pure science subjects. With the growth of these programs came a parallel growth in professional certifications and credentials.

The rise of these post-secondary credentials was driven by advancing information technologies (IT) with the power to redesign knowledge and commerce on a global scale. Rapidly changing technologies demanded a workforce with competencies outside the realm of traditional higher education. A new credentialing system grew out of the demand for certification procedures - more akin to degrees offered in most European countries. In 1989, the Certified NetWare Engineer (CNE) program developed by Novell Education became the first IT industry credentialing system to gain widespread support. A decade later, more than 1.7 million credentials were awarded by a burgeoning system of competency-based training and certification (Adelman, 2000).

The commercial and government CIS/IT world has long made certification a necessary qualification for employment, and has often required employees either to have certification when hired or obtain it within a specified period after hire as shown in Table 1 (Department of Defense, 2004).

IA Technical I	IA Technical II	IA Technical III
A +· Network +·SSCP TICSA	GSEC·SCNP Security + SSCP	CISA CISSP ·GSE SCNA
IA Management I	IA Management II	IA Management III
GSLC· GISO Security + ·TISCP	CISM CISSP· GSLC	CISSP· CISM GSLC

Table 1.U.S. Department of Defense (DoD) 8570.01-M. DoD Approved Baseline Certifications.

The CIS/IT traditional academic world has been slow to follow this lead, generally refusing even to offer credit courses that prepare their traditional students for certification. This situation is in contrast with other academic programs such as the accounting, engineering, law, medical, nursing, and teacher education disciplines, which focus instruction on preparing students for licensing exams. Thus, preparation for the Certified Public Accountant (CPA), Professional Engineer (PE) or other state licensing exams is integral to the programs in most post-secondary institutions that teach the subject (Schlichting & Mason, 2004). Few students in these disciplines would enroll in programs that did not prepare them to pass their state's certification processes.

Implications for Information Technology Certification for Educators

For the most part, traditional Arts and Sciences CIS-related faculty have a negative view of classes which align themselves to certifications. Certification is considered "trade school" work, beneath the dignity of the rigorous computer education viewed as important (Schlichting & Mason, 2004). In addition, many faculty members who are comfortable with their current expertise and protected by tenure can be slow to embrace retraining (Schlichting & Mason, 2004) or "tech refresh" in IT jargon. Moreover, given the dynamic IT environment, a constant challenge for information technology education-related faculty is to keep up with the rapid pace of change in the field.

Inspite of the general reluctance of post-secondary faculty members to seek additional certification, the need to increase their skills and abilities affects the students they teach. In fact, a crucial aspect of student learning - student engagement has been linked to student views of instructor ability and is a key attribute of program quality (Mitchell, Sheard, & Markham, 2000). Voluntary professional certifications, generally known in the Information Technology field as "IT industry" certifications, are used as indicators of professional skill

(Jenkins, 2005; Potenza, 2005; Vakhitova, 2006), and in the case of university faculty, can be an indicator of the desire to remain current in one's field and engage students in high-quality learning.

Umbach and Wawrzynski (2005) noted that the proposed link between student-faculty interactions and enhanced student learning has a strong empirical base. They used two data sets for their exploration. The first data source, the National Survey of Student Engagement (NSSE), was devised to investigate the extent to which students are involved in empirically grounded best practices and what they derive from their college experience. The second data set was drawn from a parallel study assessing the attitudes and behaviors of faculty at colleges and universities participating in NSSE. The overarching finding was that faculty are key to student success. The atmosphere created by teachers' behaviors and attitudes has a pronounced impact on student learning and engagement. Institutions where faculty members create an environment that emphasizes effective educational practices have students who are active participants in their learning and who perceive greater gains from their undergraduate experience. Interestingly, students' interactions with faculty outside of class had negligible impact; it was the behaviors that took place in the immediate context of learning that had a dramatic impact on learning.

Current Studies on IT Certifications and Student Learning

Two studies have recently provided support for faculty to consider acquiring IT certifications. Reimers (2009) investigated high school student learning outcomes, seeking to determine if instructor IT certification made a difference in student learning outcomes, which were indicated by standardized vocational testing scores (VOCAT). Andersson (2009) investigated undergraduate college student perceptions of certified and non-certified IT instructors. Andersson sought to determine whether student perceptions were affected relative to the certification of the instructors, defining IT industry certifications as certifications that verify competence through an array of requirements including education, experience, and examinations (McKillip, 2002; Parker & Smith, 2004).

Methodology

Reimer's (2009) study examined student outcomes and instructor certification. Nearly 2500 students post-test results from the State of North Carolina Vocational Competency Achievement Tracking System (VoCATS) for technology education scores were collected from nine North Carolina countries to measure student achievement. To determine teacher qualifications (IT certifications), a web instrument was created and administered to 80 instructor participants in the selected countries. Potential respondents received an email notice and description of the study. They were given the Internet URL for responding to the questionnaire. Of the 80 teachers, 43 teachers participated in the study with nine teachers holding IT industry certifications.

Andersson's (2009) study examined a single variable (perception of IT certification) and it's effect on student perceptions of (a) effectiveness, (b) technical qualifications, (c) teaching methodology, and (d) student engagement). Because of the similarity of the study with McKillip's (2001) study, a similar methodolgy was used to establish the perceived value of IT certified instructors versus non-IT certified instructors by IT students. The primary statistical analysis included frequency distribution and central tendency data (such as mean, median, mode). The questionnaire surveyed CIS students attending regionally accredited post-secondary schools in the US. Potential respondents received an email notice and description of the study, including the Internet URL for responding to the questionnaire. The URL remained open for 10 days. Within the study period, 156 CIS students responded, 147 that were usable. Both Andersson's (2009) and Reimer's (2009) survey instruments were presented electronically by an independent vendor employing multiple layers of security to ensure that the account and data remain private and secure.

Results

As previously noted, many post-secondary CIS/IT *faculty* were unconcerned about the emergence in the 1990s of "a new, parallel universe of post-secondary credentials"

(Adelman, 2000). However, the researchers found that CIS/IT *students* were keenly aware of instructors who were certified. Reimers' study (2009) found a significant difference in the learning outcomes of secondary students between technology courses taught by certified and non-certified instructors; students whose instructors held IT industry certifications had higher levels of achievement than their non-certified peers (Figure 1).

Andersson's (2009) study found that college undergraduate students showed a significantly greater perception of their instructor's effectiveness, teaching skills, technical expertise, and their own engagement in their classes with certified instructors as shown in the Figures 2,3,4 and 5.

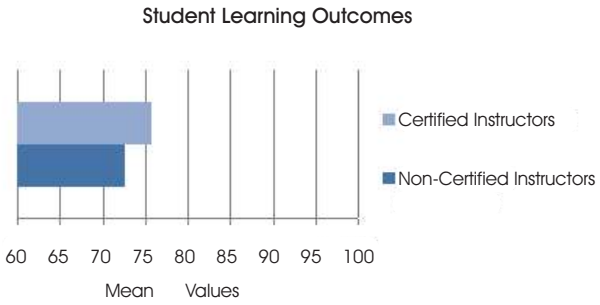

Figure 1. Secondary student learning outcomes when taught by certified and non-certified instructors.

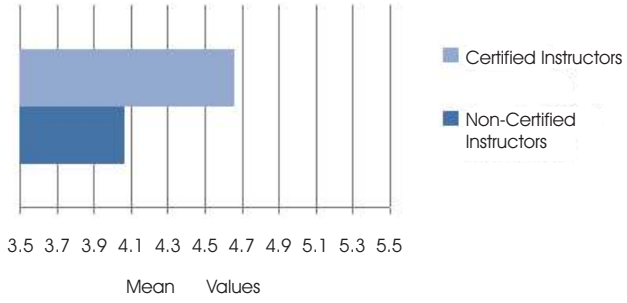

Figure 2.Undergraduate students' perceptions of IT certifications on Instructor Effectiveness.

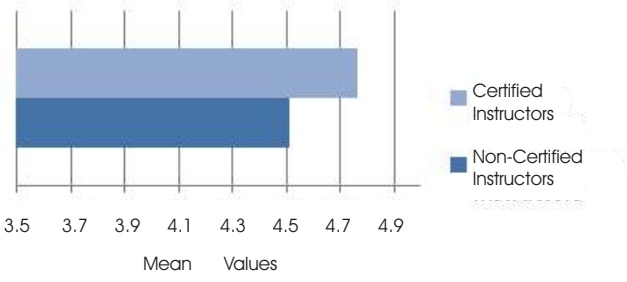

Figure 3. Undergraduate students' perceptions of IT certifications on instructor technical expertise.

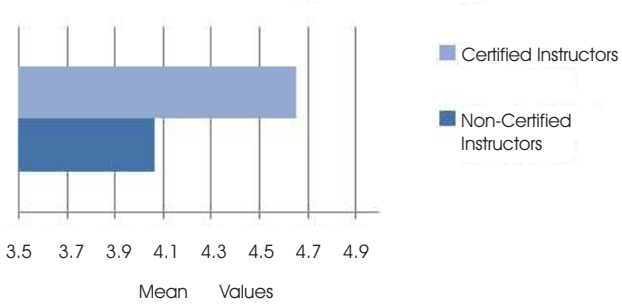

Figure 4. Undergraduate students' perceptions of IT certifications on instructor teaching methodology.

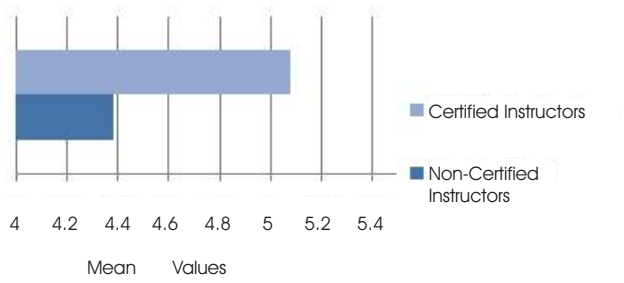

Figure 5. Undergraduate students' perceptions of instructor IT certifications on student engagement.

Conclusion

The results of Reimers' (2009) and Andersson's (2009) investigations of high school students' outcomes and undergraduate CIS/IT students' perceptions of IT industry certified instructors revealed information about the extent of IT certification on students' learning outcomes and perceptions of their instructors regarding teaching effectiveness, teaching methodology, technical qualifications, and class engagement. This provides additional information for developing appropriate instructor qualifications in the classroom.

The research shows that student perceptions of instructors possessing IT certifications were favorable; instructors were found to have higher teaching effectiveness, better teaching methodology and class engagement. In addition, IT certifications permit instructors to document their domain expertise via relevant IT certifications. Furthermore, relevant IT certified instructors may be better able to deliver content because IT certifications are reflective of the real-world needs of industry. It appears that teachers with IT certification can better captivate and motivate their students.

Many post-secondary institutions (e.g., Mount Olive College and American Public University System) have taken steps to align parts of their CIS/IT curriculum with IT certifications recognized by the U.S. Department of Defense or organizations such as Microsoft or Cisco. Results of the current studies suggest that IT certifications of faculty do affect students and that these factors can positively impact student success and program completion - a key aspect of program quality.

As programs come under increasing scrutiny in terms of measuring learning outcomes, completion rates, and student success, CIS/IT program administrators may need to consider whether additional faculty attributes beyond a terminal degree in CIS/IT or a related field is necessary when recruiting new faculty. There are (generally) six major CIS/IT disciplines; Computer Engineering, Computer Science, Computer Information Systems, Information Technology, Systems & Software Engineering, and Mixed Disciplinary Majors (e.g., BioInformatics, Computational Science, Gaming/Animation, Health Informatics, etc.). Some disciplines, such as Computer Engineering, have few, if any IT industry certifications at this time. Other disciplines, such as Computer Information Systems and Information Technology, have quite a few, depending on the subfield focus (e.g., network administration, security, forensics, telecommunications, etc.). A major research university, whose departmental "product" tends to be traditional graduate degree researchers, a relatively small percentage of available employment, may not be the best choice for someone who is attracted to the above average employment and salaries of successful "real world" practitioners in the CIS/IT field and an increasing number of educated students are realizing this.

Just as engineering students expect their faculty to be licensed as a Professional Engineer (PE), law students expect their faculty to have passed the state Bar exam, medical school students expect their faculty to be board certified, nursing school students expect their faculty to be professionally licensed as Registered Nurses (RN's), and accounting students expect their faculty to be certified as CPA's or fraud examiners, CIS/IT students increasingly have expectations of CIS/IT department faculty's qualifications for the topics they teach. Other departmental considerations include professional development incentives for current school faculty, ensuring that the school's current faculty can answer the students' questions (fairly or unfairly, not knowing what an Microsoft Certified System Engineer (MCSE) or Cisco Certified Internetwork Expert (CCIE) that may raise serious questions in the students' minds), whether the department has the resources for hands-on lab experiences with equipment comparable to that used in the field, and articulation agreements with 2-year schools which increasingly align their programs with the major industry-recognized certifications.

With the value of IT certifications as an attribute of teaching effectiveness established, more post-secondary faculty may be interested in securing IT certification if they can gain the support of their administration. Faculty can request or implement a continuing education program for CIS/IT faculty that would promote the development of professional learning communities and beneficial changes within a technology curriculum that is more in alignment with the IT needs of industry.

As noted previously, empirical evidence suggests that certification raises competence in fields that have certification standards (Parker & Smith, 2004). Industry experts point out several advantages to having professional credentials and certification. Walter McFarland, vice president of Booz Allen Hamilton, provided compelling reasons why technology education professionals should contemplate advancing their credentials (Davenport, 2006).

First, credentialing meets increasing demands for continuous development. Refining skills and expanding professional networks are two key strategies that fall under the heading of continuous development. Reflecting the general trend, ongoing professional development is advocated for cultivating and retaining committed technology teachers (Hammond, 2002) and keeping college faculty informed of pedagogical and technological innovations (Kemp & O'Keefe, 2003).

Second, certification enhances marketability (Davenport, 2006). Randall and Zirkle (2006) found advantages from teaching methodology to partnering with industry. By doing so, educational institutions gain access to industry-sponsored IT curricula designed to meet market demands and that are easily aligned with state and national IT standards. This is especially relevant to community colleges that have traditionally been in the forefront of preparing students for careers in high growth industries (Boggs, 2004; Quick & Davis, 1999). Additionally, partnerships with business and industry serve as a vehicle for assessing the quality of IT and management information systems (MIS) programs (Paranto, 2002).

Third, credentialing confers additional benefits to the organization by increasing the level of collective expertise and demonstrating the "commitment of the organization to the development of its human capital" (Davenport, 2006). In addition to preparing students for technology related careers, college administrators acknowledge that they are catering to a technologically sophisticated student body adept with a range of IT tools.

Fourth, professional certification is one of the defining characteristics of a profession. Specifically, a hallmark of any profession is its ability to articulate the body of knowledge that defines it. Certification is demonstrated mastery of that specific body of knowledge (Davenport, 2006). Professional certification enhances the status of the school or department.

The results of Reimers' and Andersson's studies in particular suggest that in post-secondary institutions that emphasize teaching excellence, CIS instructors may wish to possess relevant IT industry certifications prior to teaching a related CIS class, mirroring the employment qualifications found in industry. Another suggested application of the research concerns the promotion of learning environments that encourage students to obtain their own IT industry certifications. CIS instructors who are certified are more likely to support this type of learning environment. Since many employers require IT industry certifications as a prerequisite to employment, a learning environment that engages students through certified instructors will better prepare students for employment in the field of IT.

Further, as noted previously, student engagement in the learning process is a key indicator of quality. Engagement quality is one that contributes to enriching learning experiences for students that positively affect their growth and development (Haworth & Conrad, 1997). Anderson and Miller (1997) unequivocally stated that students' expectations of the instructor play a significant role. Umbach and Wawrzynski (2005) noted that the proposed link between student-faculty interactions and enhanced student learning has a strong empirical base. These researchers used two data sets for their exploration, the National Survey of Student Engagement (NSSE), and a parallel study assessing the attitudes and behaviors of faculty at colleges and universities participating in NSSE. The finding was that faculty members are important, that the attitudes and actions of faculty members work to shape a culture that reflects best practices in undergraduate education (Umbach & Wawrzynski, 2005).

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